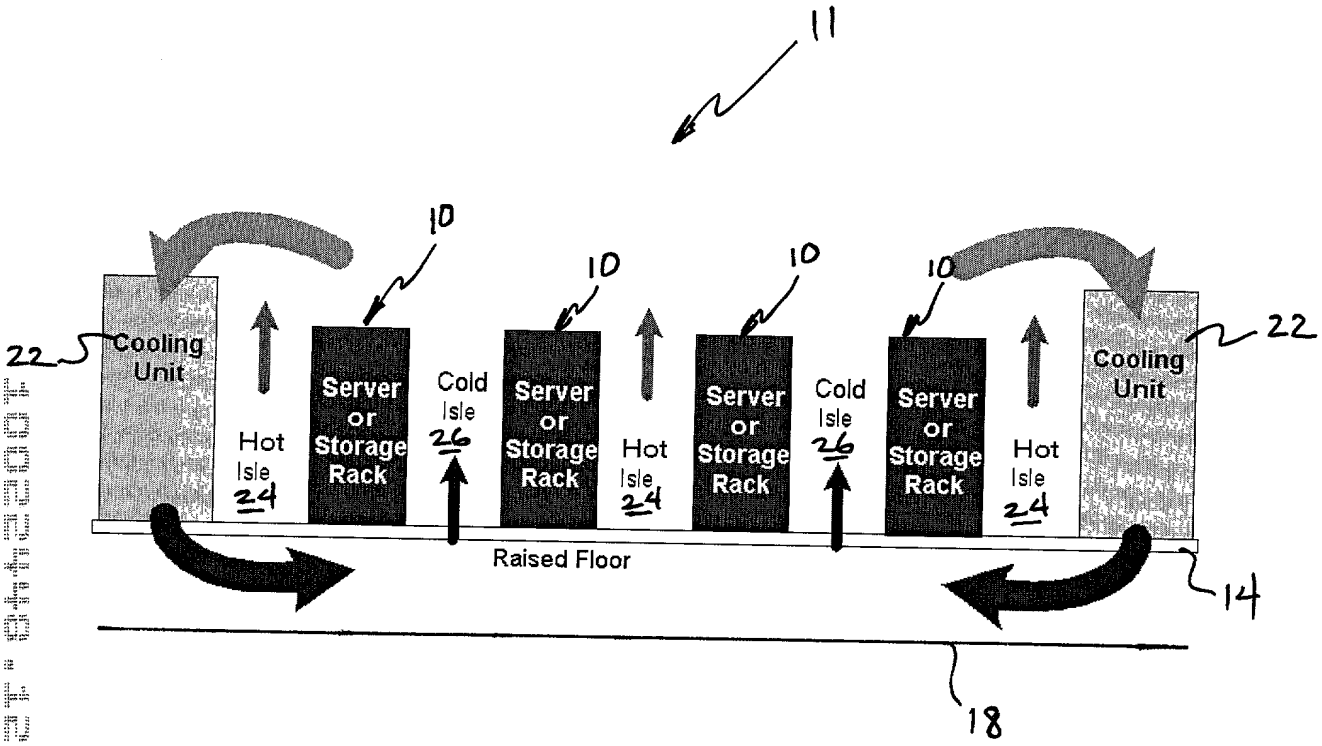
11
10
10
10
10
22
Cooling Unit
Server or Storage Rack
Cold Isle
26
Hot Isle
24
Server or Storage Rack
Hot Isle
24
Server or Storage Rack
Cold Isle
26
Server or Storage Rack
Hot Isle
24
22
Cooling Unit
Raised Floor
14
18

Figure 1A

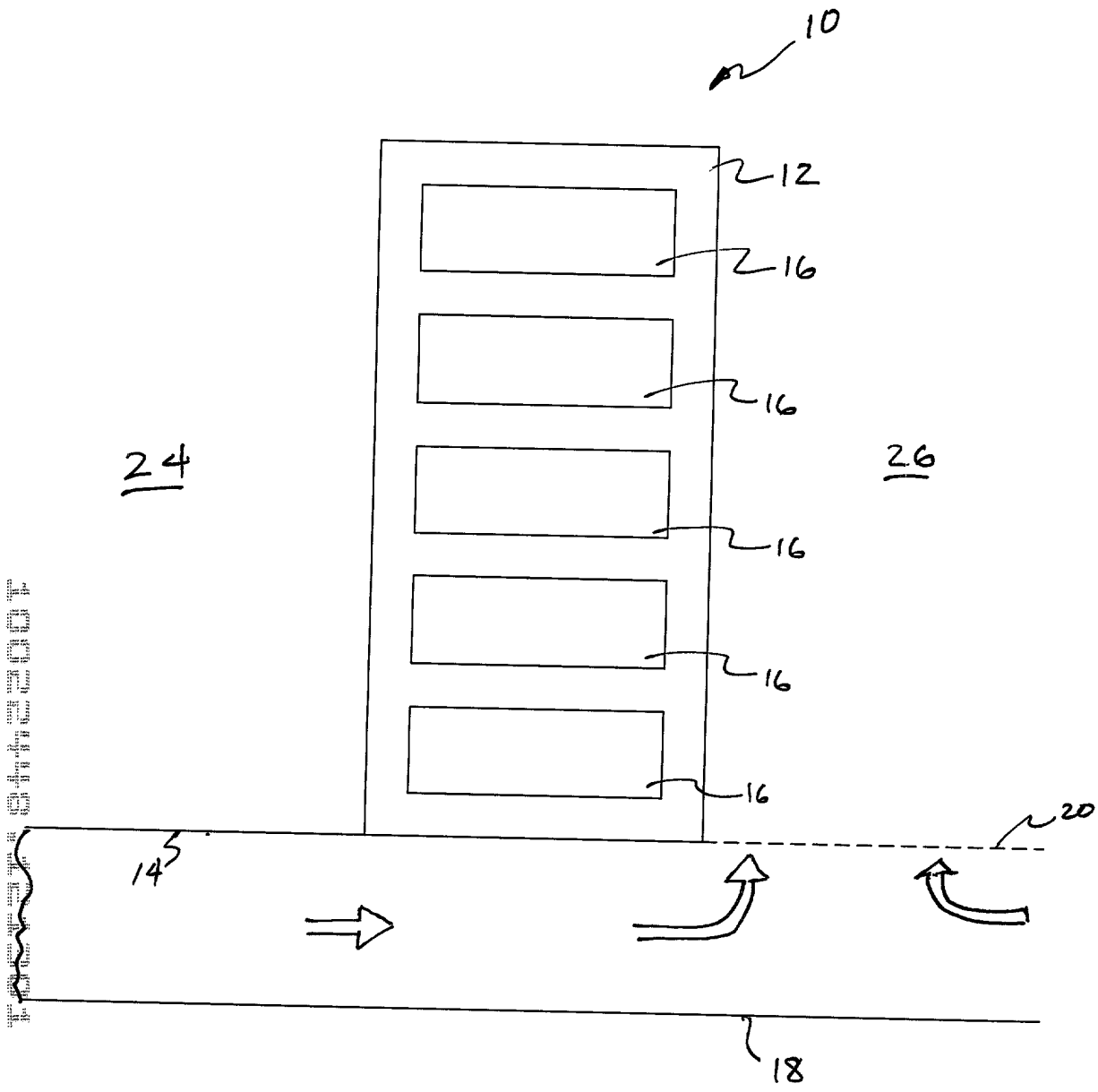

FIGURE 1B

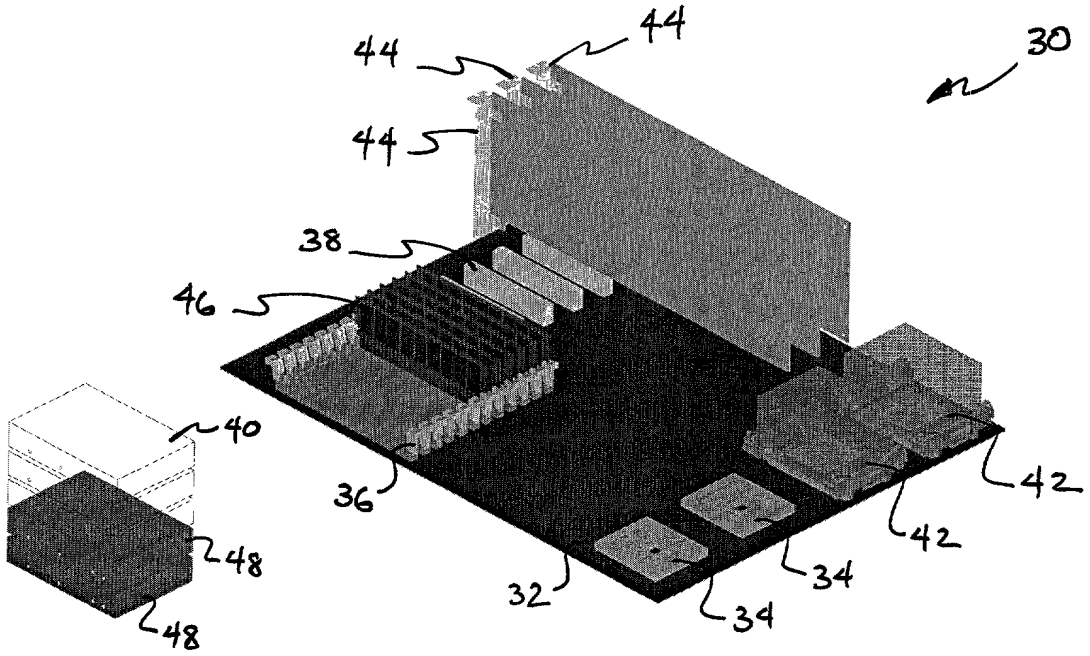

Figure 2A

Component	Actual Config.	Max Config.	De-rating factor	VR Efficiency	Power Range Lower-Upper (Watts)	Power Consumed (Watts)
Processors (CPU)	2	4	0.8	0.85	30-60	$\frac{(4\times60\times0.8)}{0.85}=225.9$
Memory	6	12	0.7	0.85	5-20	$\frac{(12\times20\times0.7)}{0.85}=197.6$
I/O Adapters	3	8	0.5	1.0	5-20	$\frac{(8\times20\times0.5)}{1.0}=80$
Disk Drives	2	5	0.8	1.0	10-20	$\frac{(5\times20\times0.8)}{1.0}=50$
					P_{MAX} →	553.5W

Figure 2B

Component	Quantity	Power (Watts)	De-rating Factor	VR Efficiency	Subtotal
1	q_1	p_1	D_1	E_1	$q_1(\frac{p_1 D_1}{E_1})$
⋮	⋮	⋮	⋮	⋮	⋮
j	q_j	p_j	D_j	E_j	$q_j(\frac{p_j D_j}{E_j})$
⋮	⋮	⋮	⋮	⋮	⋮
J	q_J	p_J	D_J	E_J	$q_J(\frac{p_J D_J}{E_J})$
				P_{CONFIG} →	$\sum_{j=1}^{J} q_j(\frac{p_j D_j}{E_j})$

Figure 3A

Component	Quantity	Power (Watts)	De-rating Factor	VR Efficiency	Subtotal (Watts)
Processors	2	40	0.8	0.85	75.3
Memory	6	10	0.7	0.85	49.4
I/O	3	10	0.5	1.0	15
Disk	2	15	0.8	1.0	24
				P_{CONFIG} →	163.7W

Figure 3B

Component	Quantity	Power (Watts)	De-rating Factor	VR Efficiency	Subtotal (Watts)
1	q_1	p_1	D_1	E_1	$q_1(\frac{p_1 D_1}{E_1})$
⋮	⋮	⋮	⋮	⋮	⋮
j	q_j	p_j	D_j	E_j	$q_J(\frac{p_J D_J}{E_J})$
j+1	q_{j+1}	$P_{(MAX)\,j+1}$	D_{j+1}	E_{j+1}	$q_{J+1}(\frac{p_{(MAX)J+1} D_{J+1}}{E_{J+1}})$
⋮	⋮	⋮	⋮	⋮	⋮
J	q_J	$P_{(MAX)\,J}$	D_J	E_J	$q_J(\frac{p_{(MAX)J} D_J}{E_J})$
				P_{CONFIG} →	$\sum_{J=1}^{J} q_J(\frac{p_J D_J}{E_J}) + \sum_{j=J+1}^{J} q_J(\frac{p_{(MAX)J} D_J}{E_J})$

Figure 4A

Component	Quantity	Power (Watts)	De-rating Factor	VR Efficiency	Subtotal (Watts)
CPU	2	40	0.8	0.85	75.3
Memory	6	20	0.7	0.85	98.8
I/O	3	20	0.5	1.0	30
Disk	2	20	0.8	1.0	32
				P_{CONFIG} →	236.1W

Figure 4B

Component	Quantity	Power (Watts)	De-rating Factor	VR Efficiency	Subtotal (Watts)
1	q_1	p_1	D_1	E_1	$q_1(\frac{p_1 D_1}{E_1})$
⋮	⋮	⋮	⋮	⋮	⋮
j	q_j	p_j	D_j	E_j	$q_j(\frac{p_j D_j}{E_j})$
⋮	⋮	⋮	⋮	⋮	⋮
J	q_J	p_J	D_J	E_J	$q_J(\frac{p_J D_J}{E_J})$
				P_{CONFIG} →	$\beta\left[\sum_{j=1}^{J} q_j(\frac{p_j D_j}{E_j})\right]$

Figure 5A

Component	Quantity	Power (Watts)	De-rating Factor	VR Efficiency	Subtotal (Watts)
CPU	2	40	0.8	0.85	75.3
Memory	6	10	0.7	0.85	49.4
I/O	3	10	0.5	1.0	15
Disk	2	15	0.8	1.0	24
Note: β= 1.1				P_{CONFIG} →	180.1W

Figure 5B

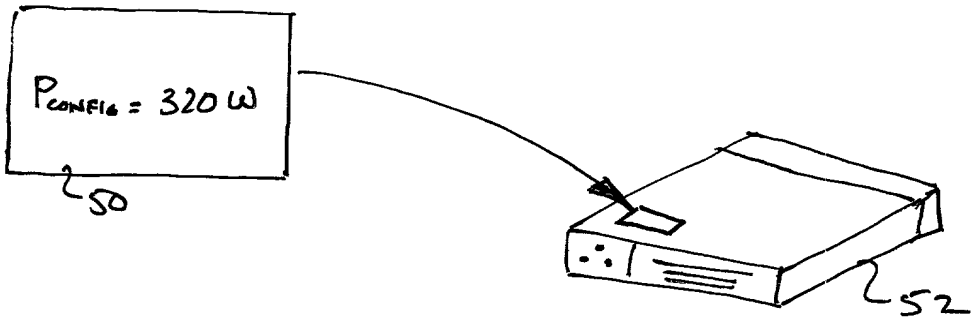

Figure 6A

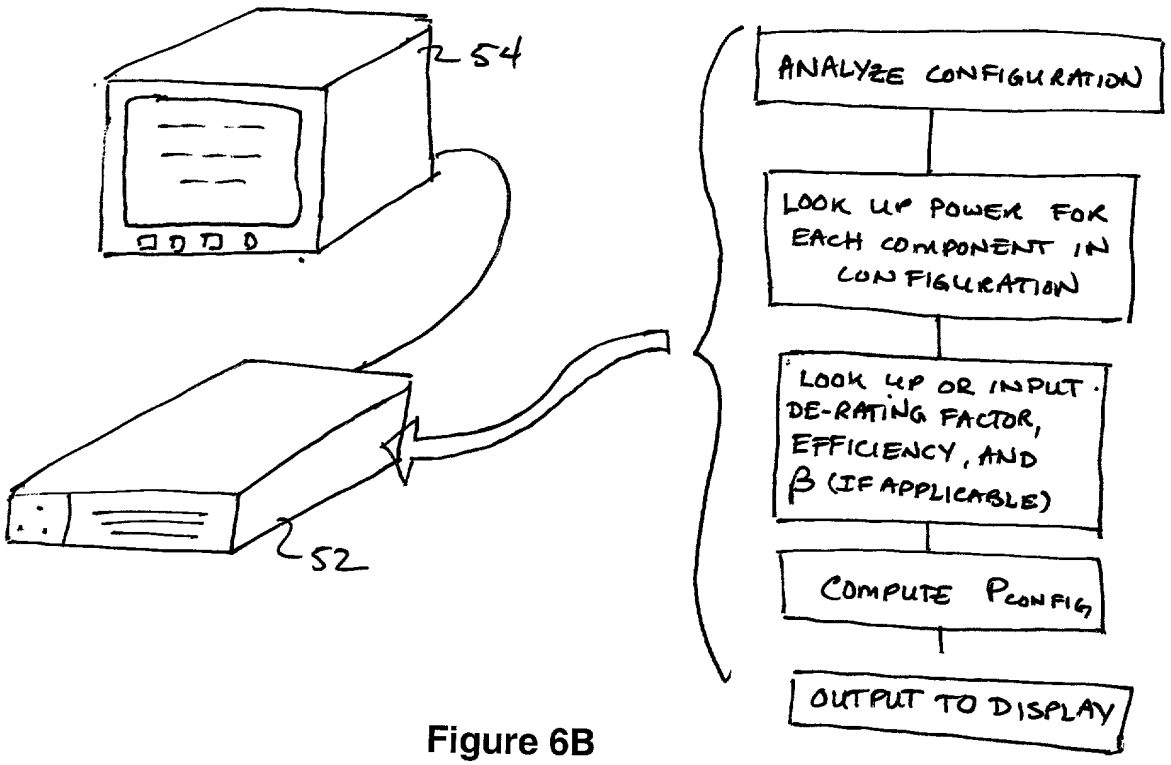

Figure 6B

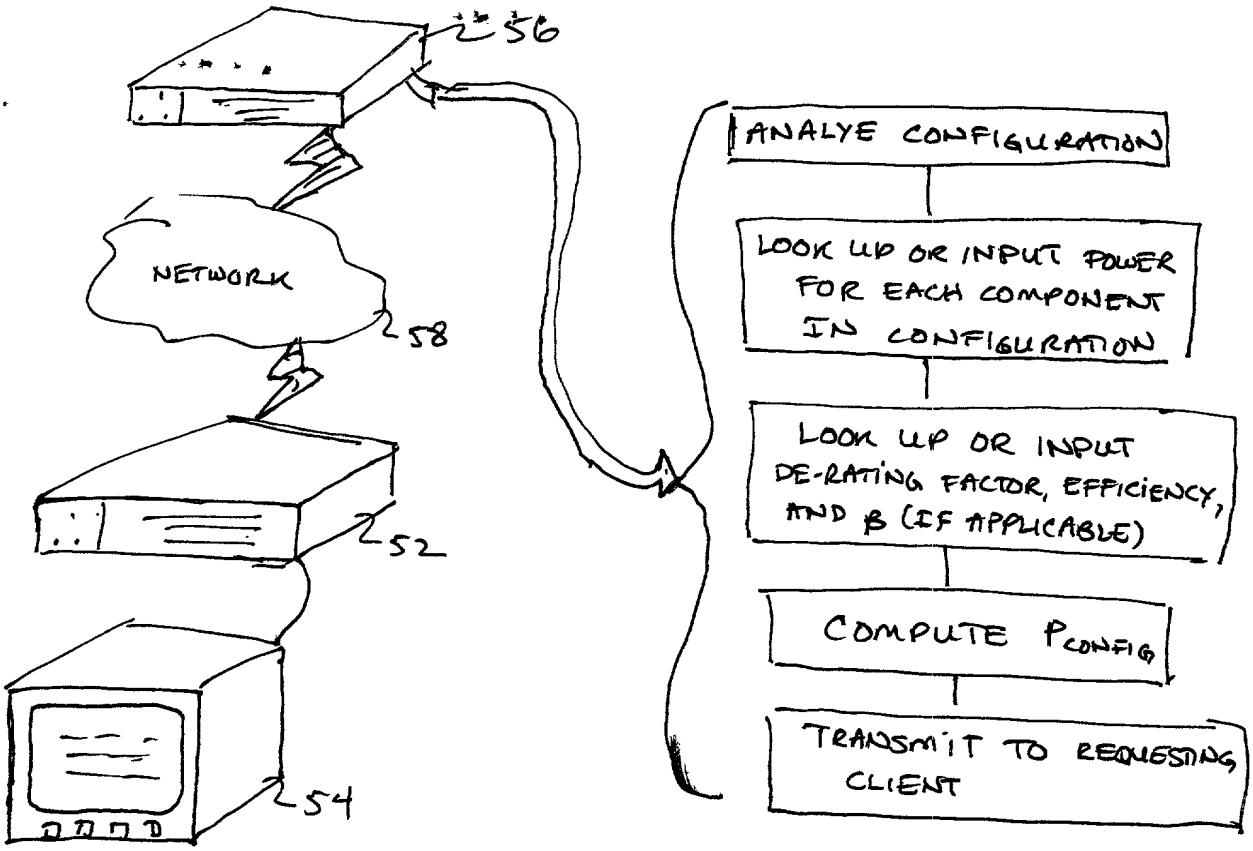
56
NETWORK
58
52
54
ANALYE CONFIGURATION
LOOK UP OR INPUT POWER FOR EACH COMPONENT IN CONFIGURATION
LOOK UP OR INPUT DE-RATING FACTOR, EFFICIENCY, AND β (IF APPLICABLE)
COMPUTE P_{CONFIG}
TRANSMIT TO REQUESTING CLIENT

Figure 6C